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Incentive Theory Inspired Education Model Aided by Blockchain

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ABSTRACT: The recent demographic trend reveals an alarming drop in undergraduate student performance. Whether it owing to lack of persistence from year one or any other miscellaneous factor, undergraduate students are falling short. Demographic shifts underway in the Indian education system will likely further compound the problem in the coming years. The objective is to adequately address the barriers and conjure a strategy which will guide the students towards academic success. The root cause for unsatisfactory performance can be identified as lack of intrinsic motivation. The students can be propelled forward by using “tangible” educational incentives as extrinsic motivation. We have designed and developed a unique solution to this conundrum employing Blockchain and Incentive theory.

KEYWORDS: Undergraduate Student, educational incentives, intrinsic motivation, Blockchain, Incentive theory

I. INTRODUCTION

Solving a problem isn't always about fixing what's wrong; it's often about amplifying what's going right. The adopted approach to tackle the problem is a recipe of reward system, reward based learning, aversion theory and blockchain. The methodology dictates using incentives to steer individuals towards desired course of action. This paper proposes the use of a private crypto-currency (RAIT Coin with its scope restricted to the University) as the reward for desirable behaviour. The blueprint consists of a set of scenarios where crypto currency can be earned and a set of services where it could be exercised. We also include a punishment in form of a fine which needs to be cleared by the student. The students can monitor their reward wallets via a web-application. Universities are facing growing pressure from state legislatures and the broader public, including their placement partners, to become more accountable for improving their student's performances.

II. OBJECTIVES OF THE PAPER

This paper has been specifically thought, designed and developed to solve this conundrum while ensuring smooth integration with the already existing system of our college (RAIT).

III. LITERATURE SURVEY

- **Gregory R. Samanez-Larkin and Brian Knutson(2015), “Decision making in the ageing brain: Changes in affective and motivational circuits”, NCBI(doi: 10.1038/nrn3917).**

As the worldwide populace ages, more seasoned leaders will be required to assume more prominent liability for their very own physical, mental and monetary prosperity. In light of this, scientists have started to look at the impacts of maturing on basic leadership and related neural circuits. Another "effect, incorporation, inspiration" (or

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AIM) system may help explain how full of feeling and persuasive circuits bolster basic leadership. Later in research it has revealed insight into whether and how maturing impacts these circuits, giving an interdisciplinary record of how maturing can modify basic leadership.

The worldwide populace is quickly maturing. Projections recommend that the extent of more seasoned people (those more than 65) will twofold from 2000 to 2050, expanding the overall number of more established leaders in the public eye, especially in created nations. Nearby these statistic movements, governments and organizations have started to execute approach changes that will increment more seasoned people's obligation regarding keeping up their very own wellbeing and money related welfare. The utilization of neuroscience strategies to address age-related changes in basic leadership has recently started and brings up a greater number of issues than it answers. For example, in which choice situations is lessened misfortune expectation accommodating versus unsafe. Whatever degree are age-related changes in choice execution because of physiological changes versus mental procedures for adapting to those changes. Albeit some proof proposes age related decreases in dopamine action other proof focuses towards more extensive age-related neurochemical changes (in noradrenergic and glutamatergic movement) all of which could impact choice execution. Besides, to what degree do auxiliary changes impact correspondence between pivotal parts Which associations are key to basic leadership, and would they be able to be focused on and altered with mediations Finally, by what method would neuroscience be able to improve the structure and appraisal of choice guides As logical research on maturing and basic leadership develops, so will cultural enthusiasm for utilizing this examination to educate arrangement. Discoveries may advise the advancement regarding more focused on social and neural mediations that influence qualities and limit shortcomings of the maturing cerebrum. As developing quantities of more established grown-ups endeavour to settle on better choices, this new data may offer the best trust in improving their point.

- **Worthy DA1, Cooper JA, Byrne KA, Gorlick MA, Maddox WT (2014), “State-based versus reward-based motivation in younger and older adults”. NCBI (doi: 10.3758/s13415-014-0293-8)**

Ongoing decision-making work has concentrated on a differentiation between a constant, without model neural framework that is propelled toward activities that lead straightforwardly to remunerate and an all the more computationally requesting objective coordinated, model-based framework that is persuaded toward activities that improve one's future state. In this article, we inspect how maturing influences inspiration toward remuneration based versus state-based decision making. Members performed assignments in which one sort of choice gave bigger quick rewards yet the elective kind of alternative prompted bigger prizes on future preliminaries, or upgrades in state. We anticipated that more established grown-ups would show a decreased inclination for decisions that prompted upgrades in state and a more noteworthy inclination for decisions that expanded quick prize. We likewise anticipated that fits from a cross breed fortification learning model would show more noteworthy model-based methodology use in more youthful than in more seasoned grown-ups. In accordance with these expectations, more established grown-ups chosen the choices that boosted prize more regularly than did more youthful grown-ups in three of the four errands, and displaying results recommended decreased model-based methodology use. In the errand where more established grown-ups demonstrated comparative conduct to more youthful grown-ups, our model-fitting outcomes proposed this was because of the usage of a success stay-lose-move heuristic as opposed to an increasingly unpredictable model-based procedure. We propose that this move from state-based to remunerate based inspiration might be because of age related decreases in the neural structures required for all the more computationally requesting model-based decision making.

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- **Eppinger B, Walter M, Heekeren HR, Li SC (2013), “Of goals and habits: age-related and individual differences in goal-directed decision-making”, NCBI (doi: 10.3389/fnins.2013)**

In this examination we explored age-related and singular contrasts in routine (sans model) and objective coordinated (model-based) decision-making. In particular, we were keen on three inquiries. In the first place, does age influence the harmony between model-based and sans model decision instruments? Second, are these age-related changes because of age contrasts in working memory (WM) limit? Third, can display based conduct be influenced by controlling the uniqueness of the prize estimation of decision alternatives? To respond to these inquiries we utilized a two-organize Markov decision task in blend with computational displaying to separate model-based and sans model decision instruments. To influence model-based conduct in this undertaking we controlled the uniqueness of remuneration probabilities of decision choices. The outcomes show age-related shortages in model-based decision-making, which are especially articulated if surprising prize demonstrates the requirement for a move in decision methodology. In this circumstance more youthful grown-ups investigate the assignment structure, though more established grown-ups show perseverative conduct. Steady with past discoveries, these outcomes demonstrate that more established grown-ups have deficiencies in the portrayal and refreshing of expected prize worth. We likewise watched generous individual contrasts in model-based conduct. In more youthful grown-ups high WM limit is related with more prominent model-based conduct and this impact is additionally raised when reward probabilities are increasingly unmistakable. Be that as it may, in more seasoned grown-ups we found no impact of WM limit. Additionally, age contrasts in model-based conduct remained factually critical, much in the wake of controlling for WM limit. Consequently, considers other than decay WM, for example, deficiencies in the in the coordination of expected prize an incentive into vital decisions may add to the watched hindrances in model-based conduct in more established grown-ups.

- **Wirth C, Akrou R, Neumann G. and Furnkranz (2017), “A Survey of Preference-Based Reinforcement Learning Methods”, Journal of Machine Learning Research.**

Support learning (RL) methods upgrade the collected long haul compensation of an appropriately picked prize capacity. Be that as it may, planning such a prize capacity regularly requires a ton of undertaking explicit earlier information. The creator needs to consider various targets that don't just impact the scholarly conduct yet in addition the learning progress. To ease these issues, inclination based fortification learning calculations (PbRL) have been recommended that can legitimately gain from a specialist's inclinations rather than a hand-structured numeric prize. PbRL has picked up footing as of late because of its capacity to determine the prize moulding issue, its capacity to gain from non-numeric prizes and the likelihood to lessen the reliance on master information. We give a brought together system to PbRL that depicts the assignment officially and brings up the distinctive plan rules that influence the assessment task for the human just as the computational intricacy. The plan standards incorporate the sort of criticism that is expected, the portrayal that is found out to catch the inclinations, the advancement issue that must be understood just as how the investigation/misuse issue is handled. Besides, we bring up inadequacies of flow calculations, propose open research questions and quickly study pragmatic assignments that have been comprehended utilizing PbRL.

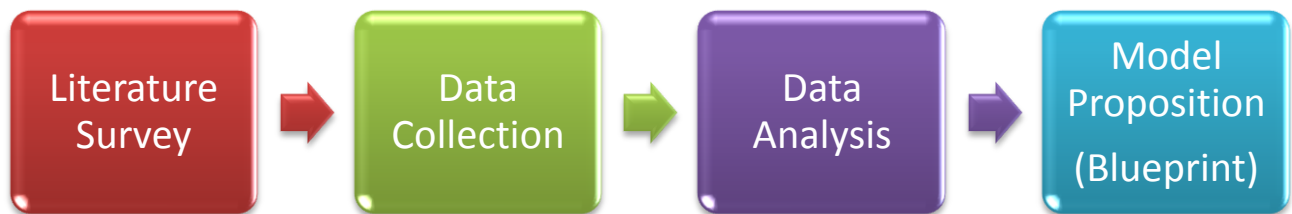
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IV. METHODOLOGY



V. EXPERIMENTAL RESULTS

5.1 Reward theory in action

- 1) **Children:** After the proof of concept reward theory was used on children. It has obtained most success with its use for conditioning children in pre-primary and primary phase of schooling. For very young children reward can be replaced with recognition as an incentive (clap of hands from fellow classmates for a good work). The punishment can also be implemented in a very simple manner (keeping hands raised for a lecture).
- 2) **Adults:** In adults, reward based learning becomes tougher to implement because of two main hindrances, reward can be switched with recognition and more importantly the reward needs to be tangible. Despite the challenges reward based learning has thrived with adults when the rewards have been of significant importance to candidates.
- 3) Tata Consultancy Services Limited (TCS) has a reward based system of its own for increasing employee productivity and satisfaction. In today competitive market and IT sector the employee performance is essential to a business. TCS has certain awards to motivate their employees to contribute more towards the organization and maintain a high threshold of performance. E.g. piece related award, profit related award, extra hours award, employee of the month, attendance related award, cash-in-your-account, suggestion reward, etc.

Teenagers: The project aims to create a reward based learning system for teenage children by providing tangible rewards based on cash-in-your-account type of reward. We also plan to include negative reinforcement as punishment for unsatisfactory behaviour in a way which fits with cash-your-account system. The project aspires to develop motivation in a student extrinsically which helps improve his performance academically.

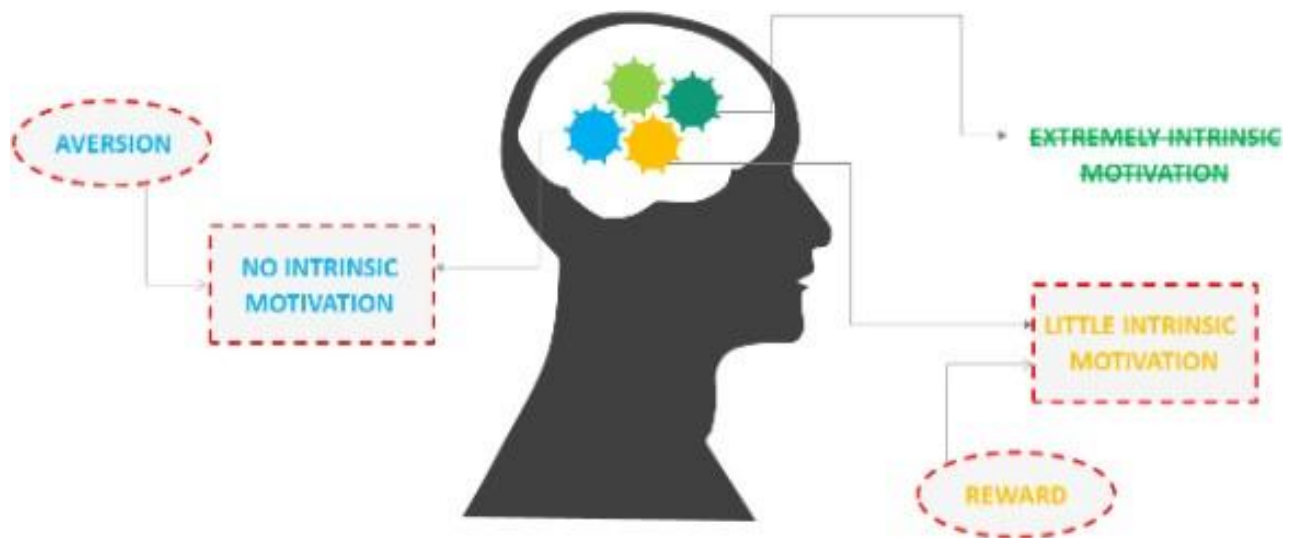
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5.2 Target Audience



Target Audience

5.3 Ideology

To a certain extent educational institutes already use incentives to motivate their students like giving a cash reward to the top 3 academic achievers. This approach has flaws as it fails to motivate the bulk of students. To motivate the bulk of students, each student must be provided with a set of goals which he believes to be accomplishable. This requires the introduction of many more objectives which the institutes consider reward worthy. Using cash as an incentive suffices when the incentive is to be offered to a few students for a certain achievement but spirals out economically if the incentive is to be offered to thousands of students for numerous achievements every week. Our proposed system which will use the RAIT Coin (colleges' own private cryptocurrency which is valid only inside the college) and the fine system to provide a way to scale up the incentives offered without putting economic stress on the institute.

5.3 Blue Print

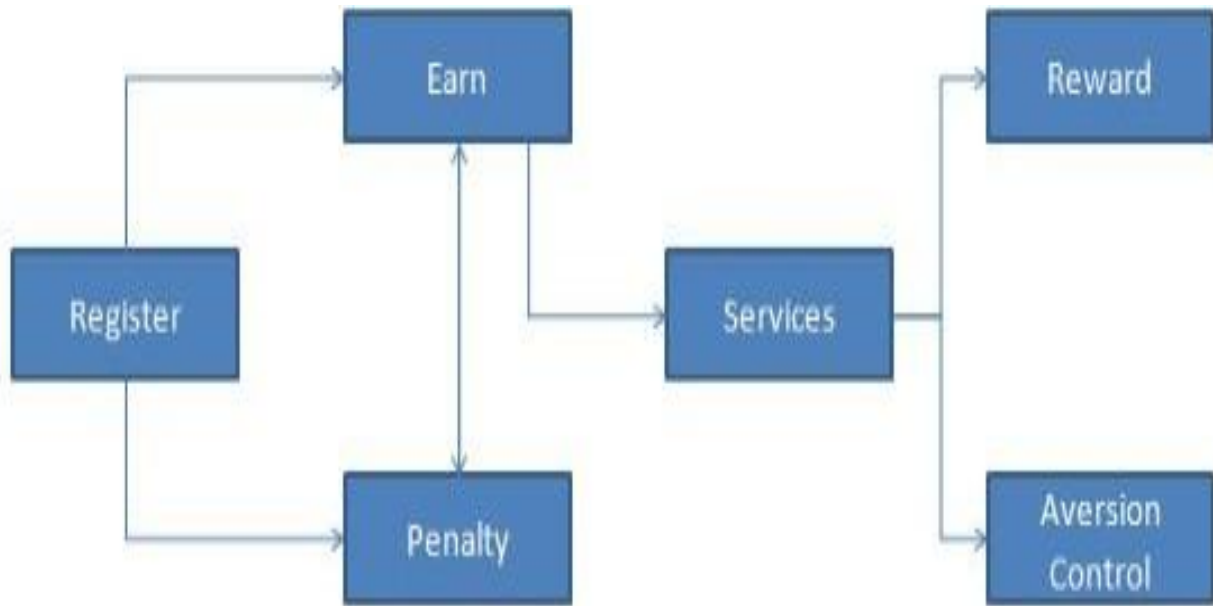
The following block diagram shows the working diagram of the project. The key component of the system is the student. The system will respond to the behaviour of the student. The behaviour of the student may be positive or it may be negative. Some of the negative behaviour includes: - Low attendance, Poor marks, falling graph of semester CGPA, misbehaving in the classroom, late submissions, bill dues in college etc. Some of the positive behaviour includes: - Good attendance score, good marks in tests, rising graph of semester CGPA, timely submissions etc. The system basically works on the reward-aversion strategy. Whenever a student inculcates a positive behaviour the system will award the student (reward) with some amount.

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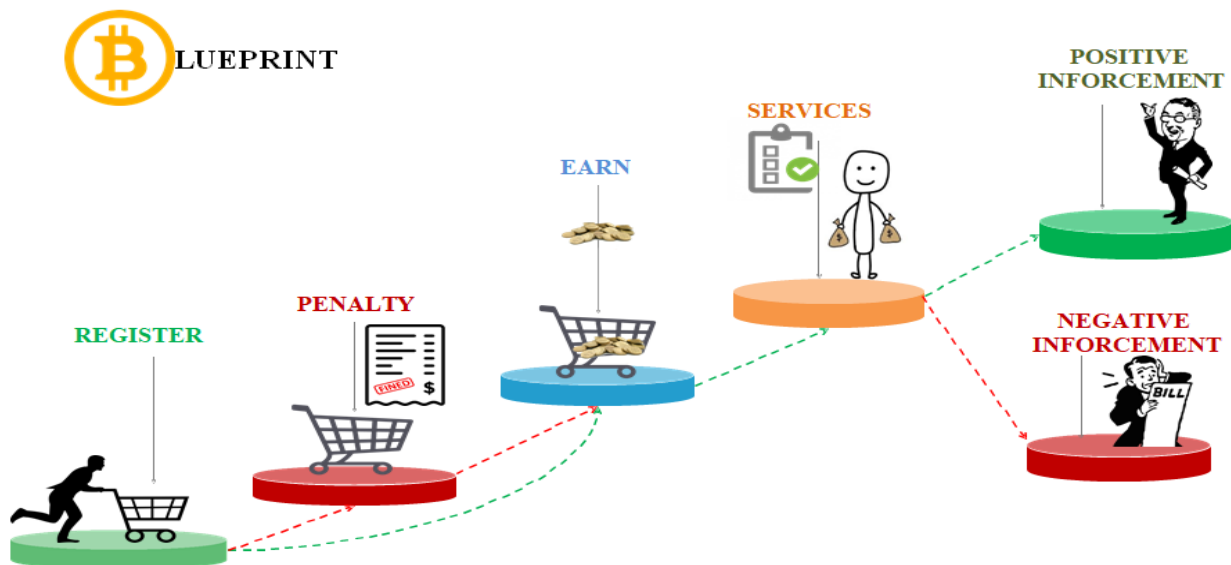
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Reward aversion strategy



Blueprint

The blueprint states that each user enrolls to the web application and creates an account. The students can then pay themselves by maintaining the ideal behaviour and improving their performance step by step with help of achievable goals. Similarly the students are also issued fines throughout the semester pertaining to a drop in their performance. If

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the rewarded cryptocurrency is greater than the sum of fines issued the students can clear the fine using earned cryptocurrency and use the spare cryptocurrency to avail further services offered by the institute (scholarship in fees, healthcare, hostel fee, mess fee, etc.). If the cryptocurrency earned is less than the bill incurred then the student must clear the difference by paying cash at the end of semester. This acts as a negative reinforcement for students which will motivate them to avoid the same scenario in the near future.

5.4 System Deployment

The System Development involves three phase which are explained below-

Phase 1

It Implements vanilla approach which requires the university/institute to set default guidelines which will be used by the system to judge the students' performance and award an incentive or issue a fine.

Example case – the university sets the requirement for attendance as 70%. So a student with 70% + attendance receives the standard incentive. An extra reward is given for excellence (90% +). Similarly if the student doesn't hit the minimum requirement he will be issued a fine (aversion strategy).

Phase 2

Part 1: Implements a smart recommendation system which works on relative performance rather than fixed static parameters.

Example case: If a student has 63% attendance last week then a buffer will be calculated ($63\% \pm 5\%$). If the performance improves in the next week then the incentive is awarded. If the performance drops below the buffer then a fine will be issued.

Part2: The system makes use of a recommendation system to provide a splurge of extrinsic motivation.

Example case: The student gets a message/mail/notification stating if he attends the next 3 lectures of xyz subject his performance for the week jumps over the buffer and he will receive the incentive (RAIT Coin). This helps to propel the students' performance making use of extrinsic motivation.

Phase3: Introduction and calculation of students' cibil score. The cibil score is a 3 digit number which lies in 300 to 900 ranges. A student's pointer indicates his academic ability but an employer may want to look at other qualities such as attendance, punctuality, involvement, etc. The cibil score is re-calculated each week depending on the rewards earned and fines incurred. Thus the cibil score is an indicative of academics, attendance, involvement and many other factors which gives a better idea about the overall progression of a student in a specific month, semester or the entire academic year.

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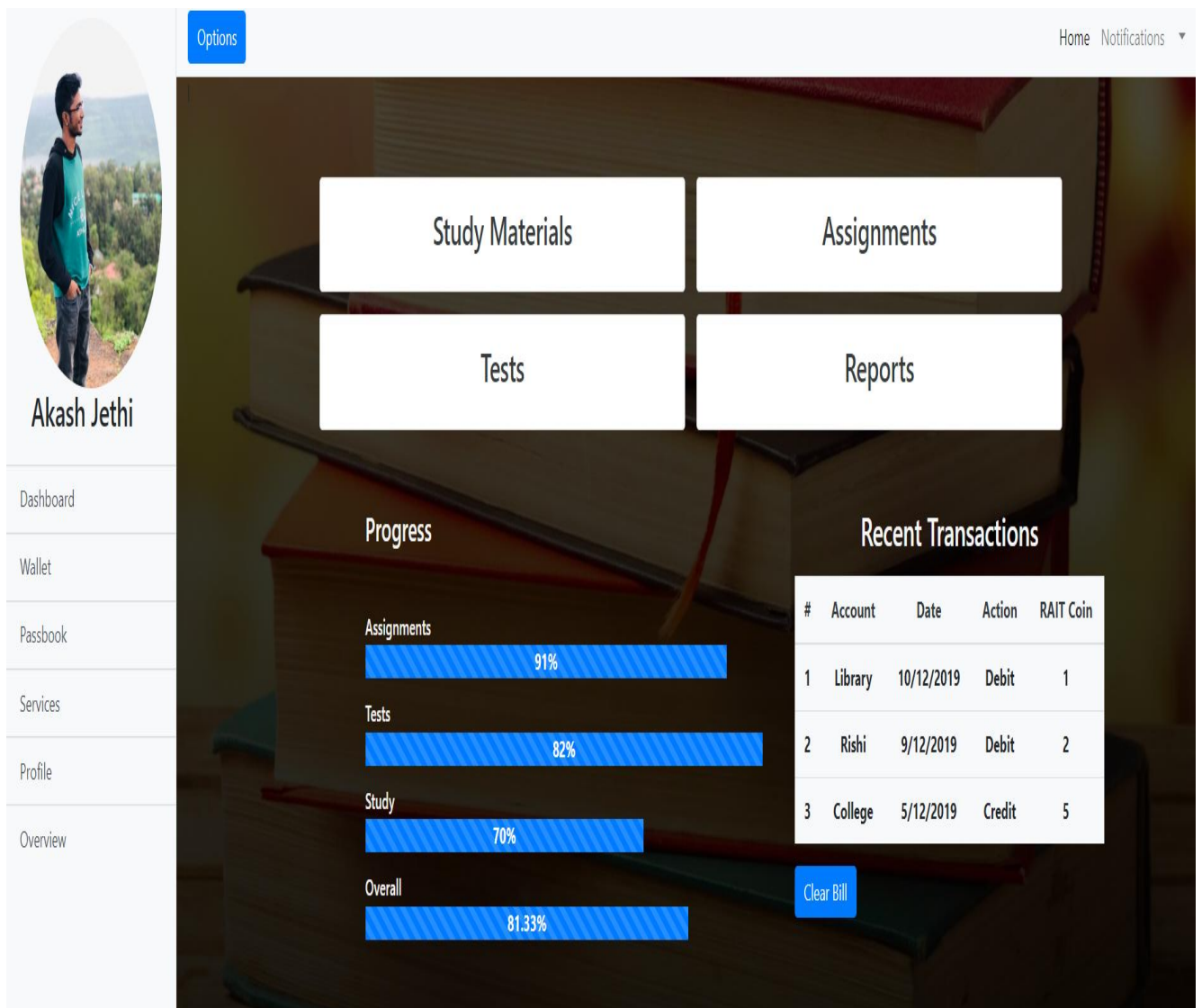
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5.5 Inputs

Implementation Stage 1



Options
Home Notifications ▾

Study Materials

Assignments

Tests

Reports

Progress

Assignments	91%
Tests	82%
Study	70%
Overall	81.33%

Recent Transactions

#	Account	Date	Action	RAIT Coin
1	Library	10/12/2019	Debit	1
2	Rishi	9/12/2019	Debit	2
3	College	5/12/2019	Credit	5

Clear Bill

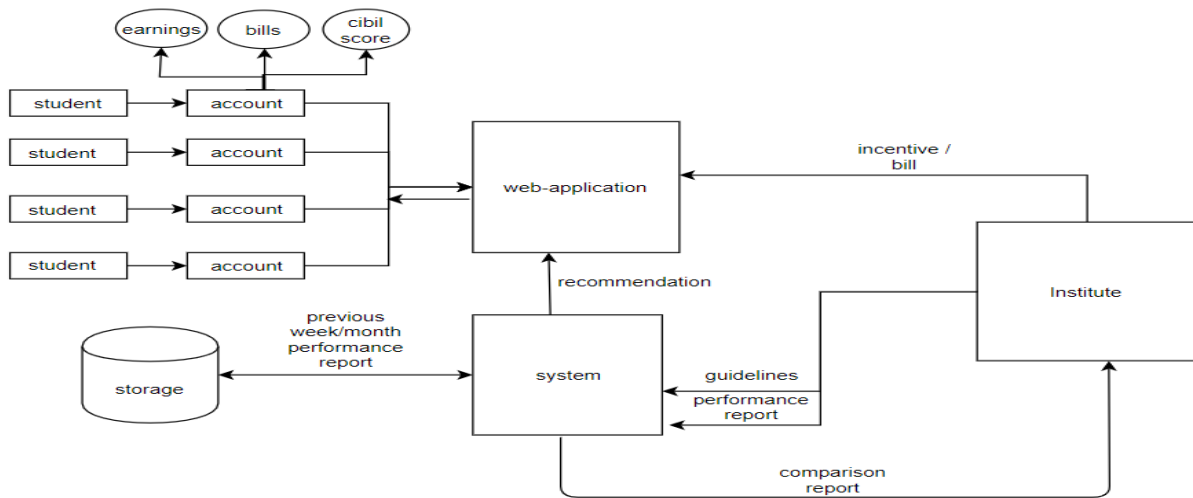
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Implementation Stage 2



Data in System

Overview Internal Transactions State Changes

[This is a Rinkeby **Testnet** transaction only]

Transaction Hash:	0x7d3c7ecd4cb20f0a428a10c8c96c74990a9ed39bc3a480782c24a7bedf7000dd
Status:	Success
Block:	5591248 4 Block Confirmations
Timestamp:	57 secs ago (Dec-10-2019 07:59:45 PM +UTC)
From:	0x8f88c3e014078592d2b6be9f6d105d526a86088a
To:	Contract 0xbc638d9a734684c528964dbc1c06e3af9691c1ad TRANSFER 2 Ether From 0xbc638d9a734684c5289... To → 0x8f88c3e014078592d2b...
Value:	0 Ether (\$0.00)
Transaction Fee:	0.000025264 Ether (\$0.000000)

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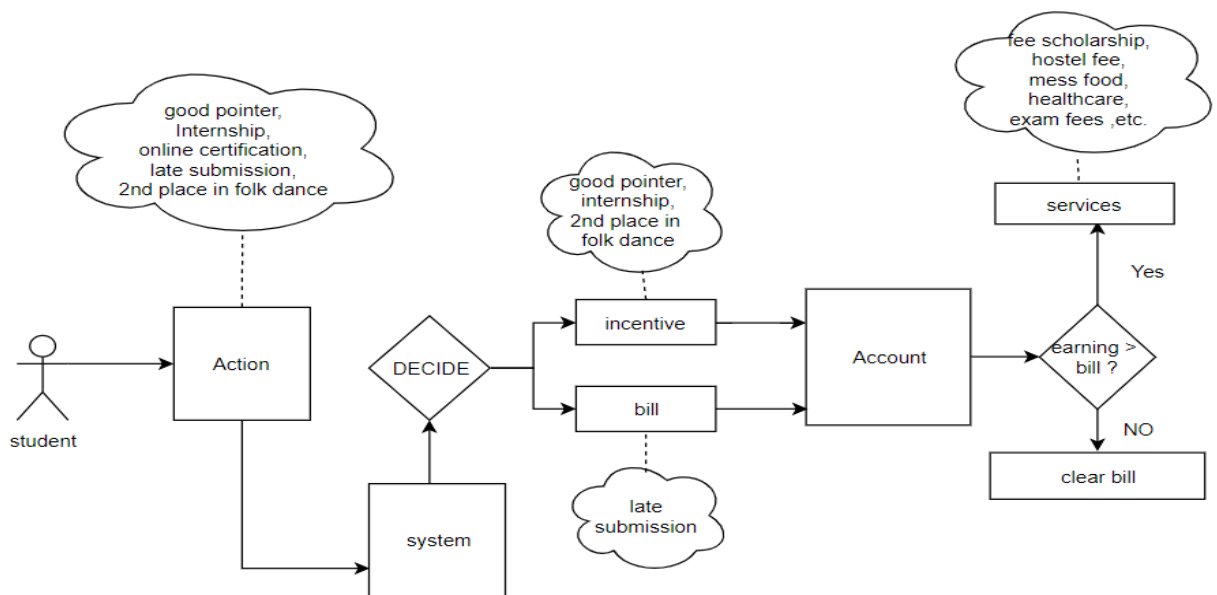
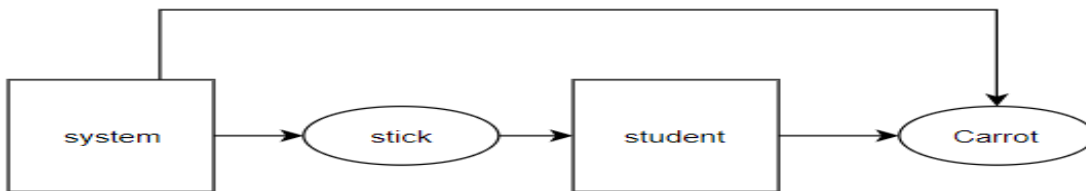
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The above figure is of Rinkeby test network which is used for development purpose. Eventual goal is to create our own Blockchain with our own coin RAIT coin.

Reward-Aversion Strategy

Stick carrot theory



Reward aversion model based on stick carrot theory

VI.CONCLUSION

Tackling an issue isn't constantly about fixing what's going on; it's frequently about intensifying what's going right. The embraced way to deal with handle the issue is a formula of remuneration framework, reward based learning and Blockchain. The technique directs utilizing motivators to control people towards wanted strategy. This task proposes the utilization of a private crypto currency (RAIT Coin with its extension confined to the University) as the award for

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attractive conduct. The outline comprises of a lot of situations where cryptocurrency can be earned and a lot of administrations where it could be worked out. We additionally remember a discipline for type of a fine which should be cleared by the understudy. The understudies can screen their prize wallets by means of a web-application. Colleges are confronting developing weight from state governing bodies and the more extensive open, including their situation accomplices, to turn out to be increasingly responsible for improving their understudy's exhibitions. This venture has been explicitly thought, structured and created to comprehend this problem while guaranteeing smooth combination with the previously existing arrangement of our school (RAIT).

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